I claim:

1. A method of monitoring thickness change in a film on a substrate comprising

illuminating a section of the film through the back side of the substrate,

measuring a light signal returning from the illuminated section, and

determining thickness change based on the measured light signal.

2. A method according to claim 1, further comprising the step of passing the light signal through a rotating coupler before it is measured.

3. A method according to claim 1, wherein the illuminated section of the film is patternless.

4. A method according to claim 1, wherein the illuminated section of the film contains a pattern.

5. A method according to claim 1, wherein the film is undergoing a process selected from the group consisting of chemical mechanical polishing, chemical vapor deposition, resist development, post-exposure bake, spin coating, and plasma etching.

6. A method according to claim 1, wherein the illuminated section of the film is illuminated by light having a wavelength between about 1,000 and about 11,000 nanometers.

7. A method of monitoring thickness change in a film on a substrate comprising

illuminating a section of the film through the back side or



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from the front side of the substrate,

measuring a light signal returning from the illuminated section,

converting the light signal to an electrical signal,

passing the electrical signal through an electrical slip ring and determining thickness change based on the electrical signal.

8. A method according to claim 7, wherein the film is undergoing a process selected from the group consisting of chemical mechanical polishing, chemical vapor deposition, resist development, post-exposure bake, spin coating, and plasma etching.

9. A method according to claim 7, wherein the illuminated section of the film is illuminated by light having a wavelength between about 1,000 and about 11,000 nanometers.

10. A method according to claim 7, wherein the illuminated section of the film is patternless.

11. A method according to claim 7, wherein the illuminated section of the film contains a pattern.

12. A method of monitoring thickness change in a film on a substrate comprising

illuminating a section of the film from the front side of the substrate,

measuring a light signal returning from the illuminated section,

passing the light signal through a rotating coupler which connects to an analyzer and monitors thickness change based on the measured light signal.

13. A method according to claim 12, wherein the film is undergoing a process selected from the group consisting of chemical mechanical polishing, chemical vapor deposition, resist development, post-exposure bake, spin coating, and plasma etching.

14. A method according to claim 12, wherein the illuminated section of the film is illuminated by light having a wavelength between about 200 and about 11,000 nanometers.

15. A method according to claim 12, wherein the illuminated ~~section of the film is patternless.~~

16. A method according to claim 12, wherein the illuminated ~~section of the film contains a pattern.~~

17. An apparatus for monitoring thickness change in a film on a substrate comprising

(i) a bifurcated fiber-optic cable having a common leg and two bifurcated legs,

(ii) a rotating fiber-optic cable with two ends,

(iii) a light source,

(iv) means for analyzing a light signal, and

(v) a rotating coupler having a stationary end and a rotating end,

wherein the first bifurcated leg of the bifurcated fiber-optic cable is connected to the light source, the second bifurcated leg is connected to the means for analyzing a light signal, and the common leg is connected to the stationary end of the rotating coupler,

and wherein one end of the rotating fiber-optic cable is

connected to the rotating end of the rotating coupler and the other end is held in close proximity to the substrate.

~~18~~ 2. An apparatus according to claim ~~17~~ 1, wherein said other end of the rotating fiber-optic cable is held less than about 1 cm away from the substrate.

19. In a chemical mechanical polishing device for planarizing a film on a substrate, the improvement comprising

(i) a bifurcated fiber-optic cable having a common leg and two bifurcated legs,

(ii) a rotating fiber-optic cable with two ends,

(iii) a light source,

(iv) means for analyzing a light signal, and

(v) a rotating coupler having a stationary end and a rotating end,

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wherein the first bifurcated leg of the bifurcated fiber-optic cable is connected to the light source, the second bifurcated leg is connected to the means for analyzing a light signal, and the common leg is connected to the stationary end of the rotating coupler,

and wherein one end of the rotating fiber-optic cable is connected to the rotating end of the rotating coupler and the other end is held in close proximity to the substrate undergoing chemical mechanical polishing.

~~20~~ 4. The device according to claim ~~19~~ 3, wherein said other end of the rotating fiber-optic cable is held less than about 1 cm away from the substrate.



18 add B7 add O' add E1 add 73 add G1